October 28, 2013

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, SW, Room TW-B204
Washington, DC 20554

Re: Response to WISPA Ex Parte
September 18, 2013
WC Docket No. 10-90

Dear Ms. Dortch:

This letter is submitted to the Commission on behalf of the Nebraska Rural Independent Companies identified below (the "Nebraska Companies")[1] in response to the ex parte communication[2] transmitted to the Commission on September 18, 2013 by Stephen E. Coran, counsel for Wireless Internet Service Providers Association ("WISPA").

Vantage Point Solutions ("Vantage Point"), the Nebraska Companies' engineering consultant, has reviewed several of the contentions contained in the WISPA Letter regarding the Nebraska Companies' Presentation[3]. The following sections discuss some of the technical errors contained in the WISPA Letter.

## Discussion

## 1. Fixed Wireless services are not comparable in quality or price.

The WISPA ex parte disputes the Nebraska Companies' statement that fixed wireless broadband services "are not comparable in quality or price" and "are limited in speeds, capacity, functionality, and

[1] The Nebraska Companies are: Arlington Telephone Company, Blair Telephone Company, Cambridge Telephone Co., Clarks Telecommunications Co., Consolidated Telephone Company, Consolidated Telco, Inc., Consolidated Telecom, Inc., The Curtis Telephone Company, Eastern Nebraska Telephone Company, Great Plains Communications, Inc., Hamilton Telephone Company, Hartington Telecommunications Co., Inc., Hershey Cooperative Telephone Company, Inc., K & M Telephone Company, Inc., The Nebraska Central Telephone Company, Northeast Nebraska Telephone Company, Rock County Telephone Company, Stanton Telephone Co., Inc., and Three River Telco.

[2] See Letter from Stephan E. Coran, Counsel to WISPA, to Marlene H. Dortch, FCC Secretary,, WC Docket No. 10-90 (September 18, 2013) ("WISPA Letter").

[3] See Letter from Thomas J. Moorman, Counsel to the ILECs, to Marlene H. Dortch, FCC Secretary, WC Docket No. 10-90 (Sept. 6, 2013) with attached public version of the Ex Parte presentation from the Nebraska Rural Independent Companies ("NRIC Presentation").

reliability."[4] At lower data rates, those mimicking modest DSL speeds, terrestrial wireless providers can be competitive in price and possibly in service. At the higher data rates, however, terrestrial fixed wireless services are often inferior in quality and higher in cost than modern DSL services and fiber-rich landline services. In most instances, fixed wireless does not offer the speeds available over a fiber-based landline network, since it would not be economic to do so and in many instances, not technically possible. As discussed further in Section 3 below, this situation exists because the limited, shared bandwidth capacity of wireless access renders it inferior to fiber-rich landline services. Wireless access points by their very nature are shared and have limited capacity. Fiber/landline networks, on the other hand, can be configured to deliver a Committed Bit Rate ("CBR") to every subscriber that can be many times more than the entire shared capacity of a wireless access point. Unless there are only a few subscribers served by each wireless access point and the WISP partitions the access point's capacity in a CBR fashion (both highly unlikely), the wireless access point's capacity would be shared by all of the subscribers connected to that access point and would likely be oversubscribed. The limited, shared capacity of a fixed wireless network results in speed reductions for users as more customers are added to the network or the existing customers use more capacity.

## 2. WISPA's contention that 900 MHz band is not subject to line of sight issues is questionable.

The WISPA ex parte contends that the 900 MHz band is not limited to line-of-sight issues but "propagates well through foliage and around obstructions."[5] While 900 MHz spectrum can be used to communicate with devices that cannot be seen, it is not accurate to say that this spectrum is not subject to line-of-sight issues.

Generally speaking, non-line of sight (NLOS) communications refers to radio communications that rely on groundwave propagation, multipath propagation, or tropospheric scatter where communication is possible "over the horizon" or where the direct path is completely obstructed. For example, new wireless systems employ a NLOS multipath technique called Multiple Input Multiple Output ("MIMO") which can use multiple antennas at both the transmitter and receiver ends to combine signals arriving over non-direct paths,[6] but this technique is different than a radio signal's ability to propagate through foliage or other obstacles.

"Line of sight" can be a poor descriptor of radio communications and is often misused. Indeed, without true NLOS, radio waves are capable of penetrating some opaque objects, such as foliage, some walls and other modestly thin or non-metallic obstacles. Among the three unlicensed bands used by WISPs, 900

[4] Ibid., page 2.
[5] NRIC Presentation, page 3.
[6] MIMO is more often used in an attempt to improve throughput at the cell edge, even where a direct path is not available.

MHz being the lowest in frequency is the most capable of penetrating opaque objects, but such paths are still essentially line of sight, although "near line of sight" is probably a better term.

In either case, however, whether a line-of-sight path is obstructed but somewhat penetrable or when NLOS technology is employed, the radio link performance is still *significantly* impaired compared to an unobstructed direct path. Simply put, wireless broadband *will suffer* where there is not an unobstructed radio line of sight. For best performance, fixed wireless providers attempt to obtain the least obstructed line-of-sight path possible from a customer's equipment to the access point. If fixed wireless were not subject to line-of-sight issues, there would be no need or benefit to do so.[7] In contrast, wired broadband systems do not suffer from "line-of-sight" issues, which was the point being made in the NRIC Presentation.[8]

## 3. WISPA's discussion regarding broadband communications media sharing bandwidth confuses the issue.

According to the WISPA ex parte "All spectrum, licensed or unlicensed, indeed any broadband communications media including copper and fiber, are essentially shared and rely upon proper traffic engineering to effectively deliver broadband service."[9] This statement is an attempt to confuse the issue. While nearly all broadband is shared at some point, wireless is shared in the access layer (essentially the local loop). In contrast, with DSL and active fiber solutions[10] each customer has a dedicated broadband connection to the central office. While some fiber access technologies, such as Gigabit Passive Optical Network ("GPON"), may have multiple users on the same fiber, these users effectively have their own, dedicated capacity.[11] Even in instances when the GPON is configured such that users share capacity, the amount of capacity being partitioned is so large[12] that one rarely engineers around the capacity constraints.

With wireless, the limited capacity in the shared local loop is almost always an issue. The amount of total access point capacity to be shared is powers-of-ten less than for GPON. For instance, the latest, highest throughput versions of Wi-Fi-like access technology utilized by WISPs may offer as much as a 130 Mbps peak theoretical data rate,[13] to be shared by all users. After overheads,[14] the total peak

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[7] Even though true NLOS technology is employed, anyone who has used a cellphone has observed that calls are much more reliable outdoors rather than indoors, even where only modest obstacles, such as glass, obstruct the path.

[8] NRIC Presentation, page 4.

[9] WISPA Letter, page 3.

[10] With active fiber solutions, a dedicated 1 Gbps can be provided to each and every user.

[11] Typically, the sum of all users' maximum provisioned peak service speeds does not exceed the total capacity of the optical line terminal serving them.

[12] Typically 2.5 Gbps split up to 32 ways today for an equivalent 78 Mbps CBR service that could be made available to each user.

[13] For example, IEEE 802.11n, MCS15 on 5GHz.

throughput available even to a single user typically will be no more than half of this theoretical data rate even under ideal conditions.[15] Further, to properly dimension a wireless access point, one must consider its average throughput capacity – that is the sum of peak throughputs possible for all users near and far, which will be a small fraction of its single-user peak throughput capacity. Such an access point may have an actual usable average throughput capacity of 20 Mbps or less, to share among all its users. And this throughput could be reduced still further by interference – which is commonplace in unlicensed spectra, as discussed further in Section 4. Even interference notwithstanding, the access point capacity could be exhausted if the WISP were to provision a modest, dedicated 4 Mbps CBR service to only five households.

## 4. Use of unlicensed spectrum does create reliability issues as noted by the Nebraska Companies.

WISPA claims that the poor reliability statements in the NRIC Presentation are unfounded.[16] Although one can design a wireless network in order to provide good performance and reliability, many wireless networks still suffer from issues that are not present in landline networks. While 900 MHz unlicensed may have improved penetration ability compared to other unlicensed spectra, it still has limited channel bandwidth, and it is increasingly subject to interference from agricultural and utility telemetry systems now heavily permeating the band, as well as from cordless telephones, electronic billboards and other sources. Like all unlicensed spectra, governed only by FCC Part 15,[17] WISPs have no real control over when another user of the unlicensed spectrum interferes with the WISP's operations. Part 15 does not mandate any interference coordination among users, so the appearance and magnitude of interference cannot be reliably predicted or controlled. Interference causes diminished performance, causing lower throughput (as well as higher latency and jitter as discussed in Section 7), because it forces the WISP to use lower-order modulations, higher forward error correction rates and retransmissions in order to communicate. This situation renders the quality of unlicensed WISP service "unpredictable," which is not an acceptable definition of a reliable service. Landline fiber-based broadband systems do not suffer any of these unpredictable interference issues. Landline copper-based broadband systems may realize interference from power lines or other sources; however, these effects can normally be identified and mitigated.

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[14] Forward Error Correction, TCP/IP and others.

[15] The user must be very close to the tower where there is high signal strength and absolutely no interference.

[16] WISPA Letter, page 3.

[17] 47 CFR §15.5(b): Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator.

## 5. WISPA's exception to "Short Range" being referred to as a "Technical Limitation" based on deploying additional access points is not reasonable or practical.[18]

Given enough time and money, about any problem can be solved including good wireless coverage using "fill-in" as described by WISPA. For example, a tower could be built to reach each customer, but that solution is neither reasonable nor practical.

## 6. WISPA's contention that wireless service is not more susceptible to hackers is misplaced.

WISPA disagrees with the Nebraska Companies' claim that "fiber is more secure than 'over the air' technology" and is less susceptible to hackers.[19] WISPA further states that the Nebraska Companies did not provide any detail or actual data to support their claim. WISPA also argues that the FCC did not include any security in the CAF Phase II criteria and, therefore, this issue should not have been included in the Nebraska Companies' arguments. Both wireless and wireline networks are secured using protocol security. Many of the wireless networks use triple DES encryption, which is difficult to break. Nevertheless, with wireless communications, anyone can receive the signal with an antenna and proper receiving equipment. With fiber, it is more difficult for an intruder to access the signal because it is physically confined within the cable. A wireline provider would likely know when an intruder physically accesses a cable signal, but it would be difficult, if not impossible, for a wireless provider to know when and if eaves dropping is occurring.

## 7. Wi-Fi-type networks are susceptible to latency and jitter even when the network is properly deployed.

WISPA provided statements from Matthew Hardeman, a VoIP engineer. Mr. Hardeman stated that less-than-ideal traffic management can result in latency, jitter and packet loss for all types of broadband network technologies. He went on to say that the way to address these issues is by proper network configuration and tuning.[20] WISPs often use Wi-Fi-type technologies. The latency of these technologies depends upon the access protocol and link quality. With poor quality links, especially due to interference prevalent in unlicensed spectra, latency can be significant. When more retransmissions and/or slower, lower-order modulations are required to transmit error-free packets, latency increases. In addition, because a WISP cannot control or coordinate interference, packets may not arrive in the right order; thus, the transmission suffers from jitter and requires buffering, which further exacerbates

[18] WISPA Letter, page 3.

[19] Ibid.

[20] Ibid., page 4.

latency problems. Finally, atmospheric effects at some frequency modes tend to decrease performance in a similar manner as interference. Wired broadband systems rarely suffer any of these unpredictable interference issues.

## 8. WISPA's efforts to downplay the use of the wired network for wireless service providers' backbone transport should be rejected.

According to WISPA, many WISPs use unlicensed point-to-point links in the 5.8 GHz band or microwave links under Part 101 to provide transport and backhaul. WISPA acknowledged that WISPs do use wired backbone services when it is affordable.[21] There are many reasons, including technical and economic, why WISPs often utilize wireline backhaul rather than constructing wireless backhaul links. As broadband demand grows, the wireless providers have been increasingly using wired networks for transport. A paper was released by the Foundation for Rural Service called "The Truth About Wireless Broadband: The Myths and Challenges of Wireless Technology in Rural America." The paper discussed the nature of the wireless networks and how the wireless networks rely heavily on the wired networks to connect to the internet. The paper also discusses that at startup, a wireless operator may use a microwave network as much as possible to minimize backhaul expense but as data becomes more prevalent on the network it is common for wireless tower sites to be connected through the wireline network for backhaul.[22] As broadband demand continues to grow, nearly all access systems, wired or wireless, will increasingly rely upon fiber-optic transport for access to the Internet.

## 9. Facts exist that demonstrate that WISPs "impose stringent data capacity limits".

WISPA states that the Nebraska Companies do not offer any supporting evidence of stringent data caps and ignore the fact that customers exceeding a specified cap can contact their provider to obtain greater capacity.[23] It is not uncommon for wireless providers to place data caps on their offerings or include the right in the "acceptable use" agreement that usage will be monitored to restrict high-bandwidth applications. In researching data plans offered by several WISPA Members, we found that several have implemented data caps. For example, a wireless broadband provider in Arizona, CommSpeed, includes a 10 GB monthly data cap on their basic service and charges overage fees for consumption over data cap. CommSpeed notifies customers and recommends a plan upgrade when customers exceed their

[21] Ibid., page 3.

[22] See "The Truth About Wireless Broadband: The Myths and Challenges of Wireless Technology in Rural America", jointly developed for the Foundation of Rural Service by John Staurulakis, Inc., Monte R. Lee and Company, and Palmetto Engineering and Consulting, July 2011, page 6, http://www.palmettoeng.com/sites/default/files/truth.pdf

[23] WISPA Letter, page 3.

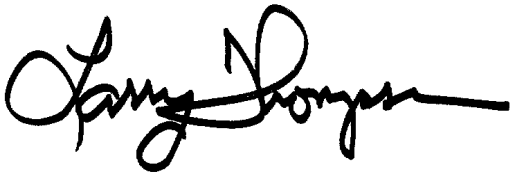
data cap.[24] Another WISPA member in California, 101Netlink, also has monthly data caps on each of their wireless internet packages and charges $10 for each 4 GB over the data cap.[25] Several other examples of WISPA members' data caps and overage charges also can be cited.

## Conclusion

Vantage Point Solutions performs both wireline and wireless engineering services for companies throughout the United States, including some WISPA members. Because of this experience, we are familiar with the benefits and shortcomings of the various broadband technologies. It is not our intention to favor one technology over another, but to give a balanced technical overview of the concerns raised in the WISPA Letter and the NRIC Presentation. Both wireless and wireline technologies can provide a valuable service to customers when used appropriately. My belief is that it will be difficult for any wireless technology to outperform a high quality, properly engineered wireline network in terms of capacity and quality when delivering fixed broadband service. As broadband demand continues to increase, the performance gap between wireless and wireline will increasingly favor a wireline network.

This letter is being filed pursuant to Section 1.1206 of the Commission's rules.

Sincerely,



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[24] CommSpeed accessed September 26, 2013, www.commspeed.net/services/residential.

[25] 101Netlink accessed September 26, 2013, www.101netlink.com/N_Humbolt_Residential.html.